American Samoa Trip Report
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Background

The U.S. Fish and Wildlife Service (USFWS) contracted Pacific Rim Conservation (PRC) to coordinate efforts to help assess seabird monitoring activities in the U.S. Tropical Pacific (USTP), identify geographic and taxonomic monitoring gaps, and develop a seabird monitoring manual aimed at improving and standardizing seabird monitoring. This contract included development of a questionnaire that was sent to land managers who are actively involved in seabird monitoring in five geographic regions that comprise the USTP: the main Hawaiian Islands, the Northwestern Hawaiian Islands, the Mariana Islands, the Pacific Remote Islands Marine National Monument, and American Samoa. A meeting was held in Honolulu, Hawaii from 12-14 July 2017 to discuss the results of the questionnaire and a variety of other related goals. Based on responses to the questionnaire and subsequent discussions that took place during the meeting, it became apparent that some of the largest gaps in monitoring were in American Samoa. These gaps included a lack of information about which species were present on various islands in American Samoa, and also a low level of monitoring for some of the species that were known to occur there. Several seabird species occur in the USTP only in American Samoa, so the lack of information about these species resulted in a complete absence of information for the entire USTP. Representatives from of the National Park of American Samoa (NPS), the American Samoa Department of Marine and Wildlife Resources (DMWR), and Rose Atoll National Wildlife Refuge who participated in the meeting in person or by webex all expressed a desire for assistance in determining the species of seabirds present, identifying monitoring goals, and devising monitoring protocols.

Dr. Eric VanderWerf of PRC and Roberta Swift of the USFWS made a site visit to American Samoa from 30 October to 10 November 2017 to help address issues related to the seabird monitoring. The goals of the visit were to: 1) gather information about American Samoa to complete the gap report; 2) visit several of the highest priority sites, with the appropriate managers, in order to better understand the challenges and needs related to monitoring seabirds at each site; and 3) develop monitoring methods for the monitoring manual, particularly for rare petrels.

A summary of daily activities and action items are provided at the end of this report.

Provisional Seabird Monitoring Recommendations

The recommendations below are based on the following information: a review of the relevant literature, particularly O'Connor and Rauzon (2004); discussions that took place during the seabird monitoring meeting held in Honolulu in July 2017; discussions with staff from the DMWR, NPS, and USFWS in American Samoa; and personal observations made during our visit in November 2017. These are offered as provisional recommendations; the exact locations where seabirds are monitored and some of the methodological details should be determined by biologists in American Samoa based on their program needs and their local knowledge. The

methods are grouped into three general categories that are similar to those used by O'Connor and Rauzon (2004).

Land-based Monitoring. Several sites on Tutuila provide good vantage points where it is possible to view concentrations of nesting, roosting, and flying seabirds. Similar sites are likely present in the Manua Islands (Ofu, Olosega, and Ta'u), but they are not identified here. If the sites can be viewed completely, then the counts would constitute a census of nesting or roosting birds. If only a portion of the birds in an area can be viewed, then the resulting data could serve as an index of abundance. Because the birds are distant at most sites, binoculars are essential and a spotting scope would be beneficial. Repeated visits to these sites using standardized survey methods can be used to monitor population trends over time. In most cases, it should be possible to monitor several species simultaneously at each site. Below is a list of sites, with brief notes on species present and methods that could be used. The sites are ordered from east to west and their locations are shown in Figure 1.

- **Aunu'u Island.** Brown Boobies, Brown Noddies, Blue-gray Noddies, and Bridled Terns use the cliffs on the southern and eastern sides of the island for roosting and probably for nesting. Some of the cliffs can be viewed from a small cove in the middle of the cliff area on the eastern side of the island, but other portions of this area can be viewed only by boat. This cove would be a good site from which to count nests and roosting birds, and also for birds that fly past. The number of birds visible on the cliffs is likely to be small, but it should be possible to count all of them, and perhaps to monitor nesting success.
- **Cape Matatula.** Brown Boobies, Brown Noddies, and Blue-gray Noddies use the cliffs for roosting and probably nesting, and several additional species fly past, including Black Noddies and Red-footed Boobies. Counts could be made of nesting and roosting birds on the cliffs and of birds flying past. Two locations appear to be suitable viewing points for this site: the rocky point at the tip of the cape near the NOAA weather station, and the shoreline near Tula Village just north of the cape. Additional observations may help determine which site is better, but based on my observations the upper site near the NOAA weather station provides a better vantage point because of its elevation above the water. This is also an excellent site from which to observe a variety of seabirds farther out on the ocean, though experience is needed to identify birds that are far away.
- **Amalau Lookout (aka NPS Fale) and Lower Sauma Ridge Trail.** The lookout next to the fale has a good view the entire eastern side of Pola Island, although it is far way and a telescope is needed to see most of the birds. In particular, Masked Boobies can be seen on the northern two peaks on Pola Island and on the last peak on the adjacent peninsula. By walking down the Lower Sauma Ridge Trail to the shoreline, a similar view of Pola Island can be had, and seabirds can be counted on the cliffs above the tide pools, including Blue-gray Noddies. This shoreline would be a suitable site from which to count birds on the adjacent cliffs, birds on Pola Island, and birds that are flying past. With practice, it might be possible to do all three counts simultaneously.
- **Tuafanua Trail.** This trail leads from Vatia Village over a saddle to a rocky beach, where there is a good view of the western side of Pola Island. The birds on the far end of the island are distant and a telescope is needed to see them well, but it is possible to get closer to them by walking to the eastern end of the beach toward Pola Island. Red-footed Boobies also nest in the trees on the slope directly above the beach. By walking along the ridge from the saddle it is possible to view some of the booby nests more closely from above.

- **Fagatele/Larsen's Bays.** I did not visit these sites, but O'Connor and Rauzon (2004) found several species of seabirds in this area, including Brown Noddies, Brown Boobies, Blue-gray Noddies, and Bridled Terns. Mark MacDonald has observed smaller numbers of birds here than at some other sites on Tutuila, but further investigation of this area is warranted.
- **Cape Taputapu.** I did not visit this site, which is located at the far western end of Tutuila, but O'Connor and Rauzon (2004) found several species of seabirds in this area, and Mark MacDonald has seen many birds in this area. Roberta unsuccessfully attempted to access the Cape. There are several small islets offshore that could be important nesting areas if they are free of predators. Further investigation of this area is warranted, and it seems like an important area for seabirds.

Boat-based Monitoring. Surveys from boats could be used to monitor seabirds in the following ways: 1) to view sites that are difficult to effectively monitor from land, such as the southeastern side of Aunu'u and sections of Pola Island; 2) to repeat the complete island circumnavigation conducted by O'Connor and Rauzon (2004); and 3) to repeat portions of the circumnavigation in areas of particular interest (e.g., the national park).

The first method would be similar to the land-based point counts described above, in which the number of nesting or roosting birds in an area would be regularly counted, except the counts would be made from a boat instead of on land. All the same considerations described for land-based counts would be applicable. The circumnavigations would be more labor intensive and would be conducted less often.

O'Connor and Rauzon (2004) made the following recommendations regarding circumnavigations: *"A complete, detailed circumnavigation survey of the Tutuila coastline can be done by boat either annually, or dependant* (sic) *on park priorities, every two to five years on a fixed interval. These surveys (for Tutuila, taking approximately one week to complete, for Aunu'u, and Ofu and Olosega, less than one day each, and for Ta'u, expectedly 2 days) should continue to be conducted as often as possible around Tutuila and Aunu'u, and for the near future once every five years in the Manu'a Group."* O'Connor and Rauzon (2004) divided Tutuila into 150 sections using the 1989 USGS topographic quad (see Appendix B of that report for site maps). The Park encompassed 21 of these units. Aunu'u Island was similarly divided into six sampling units. Each of the sampling units encompassed approximately 500 meters of coastline. Boundaries between units were determined using conspicuous natural features. If it is not feasible to survey all sections of the island, it would still be valuable to monitor the sites identified by O'Connor and Rauzon (2004) as being most important.

Montane Procellariform seabirds (Shearwaters and Petrels). Tahiti Petrel, Herald Petrel, and Tropical Shearwater are known to nest in montane habitat on Ta'u (O'Connor and Rauzon 2004, Titmus 2017), and it is possible they also nest in similar habitat on Tutuila, Ofu, and Olosega. They are difficult to monitor because of the remote location, steep terrain, and dense vegetation of their nesting areas and their nocturnal behavior at the nesting colonies. The first step in monitoring these species should be to determine if they are present and the general area(s) where nesting colonies may be located, and this can be approached in several ways, each of which is described below. If birds are detected using one of these methods, then ground searches can be done to attempt to locate nesting burrows. The initiation of ground surveys should be considered carefully because human entry into a colony on foot can facilitate access by predators. Searches

for nesting burrows could be done first, but without information about where the birds are located, the chances of finding burrows might be low and much effort could be spent fruitlessly.

The preferred option is to first deploy automated recording units (song meters) in or near suspected nesting areas, such as Mount Matafao, Mount Alava, and Rainmaker on Tutuila, and Mount Tumu on Ofu. The song meters can be left to record sounds for several weeks or even months. The song meters can be programmed to record only at night, and to record for a specified number of minutes per hour in order to preserve battery life and memory space; these settings can be adjusted depending on the length of time the units are deployed and the capacity of memory cards used. Recordings would then be analyzed digitally using a template sound for each species of interest. The advantage of this method is that it requires much less labor and data can be collected for extended periods of time without an observer present. If seabird calls are detected, then follow-up visits should be made to listen for birds at night to locate more precisely where the birds are, if they are calling from the ground or in the air, and their activity. Analysis of the song meter data can be contracted out to Conservation Metrics, or it may be possible to do this in-house if the staff has the expertise.

Second, auditory surveys could be done at night to listen for birds near suspected nesting areas, such as Mount Matafao, Mount Alava, and Rainmaker on Tutuila, and Mount Tumu on Ofu. Such surveys can be time consuming, would require camping overnight in some areas, and if birds are present in small numbers over a limited area, it may take several visits to detect them, especially if the nesting season is not well known. Auditory surveys are likely to be more productive if birds have already been detected in an area using song meters, and can help to pinpoint the location of colonies, because the data derived from song meters is not directional.

Marine radar is another method that could be used to detect the general nesting area and flight paths of these species and to monitor population trends. Radar is a good way to locate nocturnal seabirds and monitor trends in seabird populations. For example, the decline of Newell's Shearwaters on Kaua'i has been documented through repeated radar surveys (Raine et al. 2017). The flight speed, timing, and flight behavior of radar targets can be used to distinguish seabirds from slower-flying species, such as fruit bats and Barn Owls, and sometimes to distinguish between different seabird species. Many of the data recording and sorting processes involved are now automated using the latest radar models and processing software. The range of the radar depends on which unit is used and which species is being surveyed, but usually seabirds can be detected up to two kilometers away. Several sites might be suitable as radar survey locations, including the summit of Mount Alava (if permission can be obtained to drive to the summit), Pago Pago Harbor directly below Mount Alava, Afono (Rainmaker) Pass, Fagasa Pass near Mount Matafao, near the telecommunications towers in the center of the island at Milomilo Peak (near Aoloau), the NOAA weather station at Cape Matatula, and Route 002 toward the western end of the island. The coastal roads that run around much of the island also could be used as radar survey sites.

Conducting radar surveys on Ta'u also is a possibility, although there would be challenges. An unpaved road rings a portion of the island of Ta'u, affording opportunities for coastal radar surveys at regular intervals. One of the greatest challenges would be transporting the radar unit to and from the island. Ferries do transport personnel and equipment to Ta'u, and both NPS and DWMR have boats that might be able to help with transport. There are regular flights scheduled between Tutuila and Ta'u, which could be used to transport personnel. Mark MacDonald of

DMWR suggested he might be able to help transport a radar unit to Ta'u in advance of any scheduled surveys because transportation can be undependable.

Daily Activity Summary

30 October. Roberta arrived around 9:30 pm, rented a car, and drove to the Moana O Sina Hotel.

31 October. Roberta drove into Pago Pago and met with Brian Peck (USFWS) and National Park of American Samoa Superintendent Scott Burch at the NPS office. She spoke with Brian briefly about programming and deploying song meters at Rose Atoll and to Scott about the I&M Pacific Seabird Program. Roberta also acquired a copy of Rose Atoll Trimble seabird data from Brian, to give to Steve Holzman for archiving and technical assistance.

Roberta drove to Fagasa Pass with the intent to hike to the summit of Mt. Alava, but due to hard rain drove instead down to end of the road to the town of Fagatele. Next she drove to north side of the national park between Afono and Vatia, stopping at the top of Afona (Rainmaker) Pass (Fig. 1). Several White-tailed Tropicbirds could be seen flying along the cliff visible from the road, on the SW slope of Rainmaker Mountain. Some landed on clumps of vegetation on the cliff, which indicated they might be nesting there. This location was one that Mark Rauzon suggested as a possible survey location to count birds moving over the pass, and it would also be a good location for monitoring tropicbird nesting. Roberta then drove on to the Amalau Overlook (also known as the NPS Fale) near Vatia Village, from which the eastern side of Pola Island can be viewed (Fig. 1). Roberta then returned to Fagasa Pass above Pago Pago, hiking most of the way to the top of the Mount Alava before returning to the trailhead at Fagasa Pass to watch and listen for petrels until it was fully dark (~7pm). None were seen or heard.

Rainmaker Mountain viewed from Rainmaker (Afona) Pass.

1 November. Roberta drove to the western end of Tutuila Island, hoping to find suitable radar survey locations. Potential survey sites were numerous due to the extensive road system around much of the shoreline on Tutuila. The drive began in Tafuna at the Moana o Sina with a brief stop at the town of Amanave to hike to Cape Taputapu, which is a location O'Connor and Rauzon (2004) listed as a potential seabird survey point. The NPS brochure described the hike as

a short walk "along the coastline" to the cape which should be done at low tide; in reality, even at low tide, the walk was a slippery scramble over wave swept boulders along steep cliffs, through knee deep water over slippery rocks and so the hike was aborted.

Roberta drove to the end of the road at Fagamalo at the western side of the island. Several potential radar survey sites were confirmed along the road between Amanave, particularly one in the approximate vicinity of Fagali'i overlooking a large valley that opens to the ocean.

Before returning to the hotel, Roberta drove to the highest point in the center of the island at Milomilo Peak near the town of Aoloau. Multiple roads, including access roads to a cluster of communications towers and neighborhoods, provide suitable radar surveys overlooking the roadless northern shore of Tutuila Island. Reportedly, a wind tower is planned for this location, and no monitoring is scheduled, which makes the need for radar surveys on this island even more important and timely.

2 November. Roberta met national park staff at the park office at 8 am to accompany them to one of their seabird breeding sites. Roberta rode with Loi'a and Jason to the end of the road past the town of Vatia, parking at a large two-story home near the Tuafanua Trail trailhead. We hiked uphill to the top of the ridge and then turned NE and hiked off trail following the ridge. Red-footed boobies nested in small trees and shrubs growing precariously along the cliffs on the NW side of the ridge. Red-footed booby feathers were seen on the ground in area where fledglings apparently loaf. Jason implicated a stray dog that had been running loose in the area. The substrate along the ridge seemed suitable for burrow nesting seabirds, but no recently sign of seabird occupation was seen. The root systems of trees created cavities that may have potential for nesting petrels. At the entrance of a few cavities, there were signs of digging, but no other seabird sign such as guano or scent. The cavities were not manually inspected because of the presence of coconut crabs and hermit crabs on the island.

Left: Pola Island from viewed from Amalau Lookout. Right: Red-footed Booby nests in trees on cliffs above the Tuafanua Trail.

Returning down to the saddle, we turned northward on the steep Tuafanua trail and climbed down a series of steps and ropes to a long cobble beach. At the west end of the beach, there was a rocky outcrop forming a cliff around which Brown Noddies were flying and landing. This

might be a good seabird survey site. We walked east to the end of the beach where a large square boulder sits at the water line. Several species of seabirds were seen near this boulder, including a juvenile brown booby on the beach, two adult brown boobies flying and calling nearby, and many blue-gray noddies. The west side of Pola Island is visible and could be surveyed from this point.

NPS staff Lo'ia and Jason at northeastern end of cobble beach accessed from Tuafanua Trail. Pola Island in background.

3 November. Roberta met Mark MacDonald and his technician Pua at the DMWR office and drove to the Fagasa Pass trailhead to climb Mt. Matafao. The trail to Mt. Matafao begins across Route 5 from the Mt. Alava trail on a near-vertical ladder that climbs the road cut. From there, the hike proceeds south up the ridge through the forest, turning east toward the peak of Mt. Matafao (near the NPS climate change vegetation plots). We hiked to a small saddle just below the summit, which was above tree line, characterized by dense matting fern, vines, and shrubs. The trail was very steep and slippery, some portions requiring the use of ropes that were already in place, so we chose not to proceed to the summit. The round trip hike took approximately four hours (~11 am to ~3pm) at a moderate pace. Good hiking foot gear and walking sticks are essential on this hike.

Roberta Swift just below the summit of Mount Matafao.

I (Eric VanderWerf) arrived at the airport about 9:30pm. Roberta met me at the airport, showed me where my rental car was (which had been arranged by Mark MacDonald), and I followed her in her rental car to the Moana O Sina Hotel, where we both were staying.

4 November. Roberta and I returned her rental car at the airport, picked up Mark MacDonald at his house on Coconut Point, then we all drove to the village of Au'asi on the eastern end of the island, where we got on a fishing boat that took us over to Aunu'u Island. We walked around the island visiting various habitat types, and eventually reached the cliffs at the breach in the island's cindercone on the eastern side of the island. We observed several species of seabirds flying along the cliffs and landing, including Brown Boobies, Blue-gray Noddies, and Bridled Terns, and other species offshore. This spot would be a good location for point counts to monitor seabird numbers, and we talked about monitoring methods that would be suitable here.

Top: Cove on eastern shoreline of Aunu'u Island that would be a good site for monitoring seabirds. Bottom: Bridled Terns on eastern shoreline of Aunu'u Island.

5 November (Sunday). Nobody works on Sunday in American Samoa, most businesses are closed, and it is inappropriate to drive through smaller villages on Sundays to avoid disturbing people. Roberta and I spent the day in and near the National Park of American Samoa, including Afona (Rainmaker) Pass, the Amalau Overlook (also known as the NPS Fale), the Lower Sauma Ridge Trail, and hiking the 3.5-mile Mount Alava Ridge Trail, each of which have value as seabird monitoring sites.

Rainmaker Pass is directly below Mount Rainmaker, which has very steep sides and dense montane forest and shrub habitat on the upper slopes and summit. Tahiti Petrels have been heard from the pass, and it is possible they nest on the steep slopes above. The pass could be used as a monitoring site, but some night time reconnaissance visits are warranted to determine how often petrels might be detected here. White-tailed tropic birds were seen flying around and landing cliff faces below the summit, an indication that they probably are nesting here. Other seabirds appear to commute over the pass, including Red-footed Boobies and Brown Noddies. O'Connor and Rauzon (2004) suggested using Rainmaker Pass as a point for seabird counts.

The Amalau Lookout and the shoreline at the end of the Lower Sauma Ridge Trail below the Amalau Lookout are excellent vantage points for viewing seabirds on the adjacent cliffs and on Pola Island to the north. We counted nine Blue-gray Noddies flying and landing on the cliffs just above the tidepools. Although Pola island is fairly distant, the entire eastern side of the island is visible from these points and with a spotting scope it would be possible to count birds on the island. Using binoculars, we could see Masked Boobies on the northernmost two peaks of Pola Island and on the last peak on the adjacent ridge on Tutuila.

Top: Cliffs at the end of the Lower Sauma Ridge Trail used by Blue-gray Noddies. Bottom: Pola Island viewed from the Amalau Lookout (NPS Fale).

The summit of Mount Alava is one area of Tutuila where burrowing Procellariform seabirds are suspected of nesting, because it overlooks Pago Pago harbor, where grounded Tahiti Petrels are found each year. The summit area is relatively flat and is mostly forested, and thus does not appear to be suitable nesting habitat for species such as Tahiti Petrel, but the steep forested slopes below the summit appear to be more suitable. Because of the very steep terrain on these slopes it was not feasible to examine them on foot. Placing song meters on the summit to listen for birds on the slopes would be a useful first step. Radar could also be used to look for flying birds. The radar could be positioned near the harbor below the mountain, or it might be possible to drive the radar unit to the top of the mountain on the access road that is used to maintain the antennas on the summit.

View from top of Mount Alava looking down toward Pago Pago Harbor.

6 November. At 9am, Roberta and I met with Henry Sesepasara, the head of the Division of Marine and Wildlife Resources (DMWR), and Mark MacDonald and Adam Miles of DMWR. We explained the purpose of our visit, what we hoped to accomplish, and that we were available as a resource to provide technical assistance. Mark stated that he hoped to write a grant proposal to the USFWS Wildlife and Sport Fish Restoration (WSFR) Program to obtain funding for a full time seabird biologist, because he and Adam cannot take on that much more work. This funding

is available to the DMWR, but they must write a grant to justify the expenditures, and have not had time to do that yet. Roberta and I offered to work with Mark on writing such a grant. Mr. Sesepasara said he was supportive of that effort.

At 10:30am, Roberta, Mark, and I met with Brian Peck, the manager of Rose Atoll National Wildlife Refuge, and Tavita Togia (Terrestrial ecologist) and Vaivai Visa (NPS I&M), of the National Park of American Samoa and two of Tavita's staff including Lo'ia Tagoai and another technician. We again explained the purpose of our visit and how we hoped to be of assistance. Mark mentioned the idea of a dedicated seabird biologist based with DMWR, who could assist NPS staff with training and surveys. We discussed various needs and potential monitoring sites in the park and elsewhere on the island. Tavita expressed that he would like for his crew to be trained and involved in seabird surveys in the park, rather than delegating it all to a DMWR biologist, and we all agreed that NPS staff should be trained and involved. I described the gap analysis that resulted from the seabird workshop held in Honolulu in July 2017, and the seabird monitoring manual that will be completed soon. Brian asked whether the monitoring manual will provide information about predator control; I explained that it would address monitoring responses by seabirds to predator control, but not predator control itself. I mentioned other sources of information about predator control. Brian expressed an interest to eradicate predators on Rainmaker Mountain. However, it would be beneficial to know if petrels are still nesting there before considering management actions. Tavita affirmed that several NPS staff have been to the top of this mountain despite its steepness because they have permanent climate change vegetation plots there. Since the mountain is accessible, songmeters could be placed on or near the summit. Mark also described a colleague who had hiked to the top of Rainmaker Mountain.

Roberta dropped off the songmeter that she had programmed over the weekend for Brian to deploy at Rose Atoll in December.

After lunch, Roberta and Eric drove with Mark and one of his technicians (Pua) to Onenoa Village, where there was a Hawksbill sea turtle nest that Mark needed to check, and then we visited Cape Matatula at the far eastern end of the island, which is another prospective seabird monitoring area. Cape Matatula contains steep cliffs that were identified by O'Connor and Rauzon (2004) as an important seabird area. The shoreline in Tula Village on the north side of the cape and the top of the cape near the NOAA weather station each provide views of the cliffs and of birds flying past. From Tula Village, we saw Brown Noddies and Brown Boobies on the cliffs to the south. We also saw two Blue-gray Noddies standing on cliffs of the rock quarry in Tula Village, which is easily viewed from the road. The weather station at Cape Matatula is accessible by vehicle and the area around the building and by the tower would be suitable for radar surveys. We spent some time observing at each site, more time may be needed to determine which site provides a better vantage point for long-term monitoring.

Left: View from Cape Matatula looking north. Right: Potential radar survey site by weather station at Cape Matatula.

After dinner I took Roberta to the airport for her flight to Honolulu.

7 November. It rained heavily in the morning. Mark had some office work to do, I tried to visit some sites on the western end of the island, but the rain made it difficult. I worked on reports at the hotel part of the time.

In the afternoon I went back to Cape Matatula with Mark McDonald and two of his staff from DMWR (Pua and Jeff) to further explore the potential of the site as a monitoring location. The tip of the cape below the NOAA weather station would be an excellent survey location. It provides an opportunity to survey birds on the cliffs and also of birds flying past. There were 100s of seabirds flying past, and a large feeding flock containing about 1,000 birds offshore.

8 November. I went with Mark MacDonald and two of his staff, Pua and Jeff, from DMWR, and we met Chris and Tutu of NPS to look at some sites in the national park. We first went to the NPS fale at Amalau Lookout, where Roberta and I had gone on Sunday, and we looked at the seabirds on Pola Island using a telescope and we talked about monitoring methods for that site. Everyone agreed that would be a good monitoring site, as long as a telescope was available. We counted a total of 19 Masked Boobies on the northernmost two peaks of Pola Island and the last peak on Tutuila. Then we went to the beach at the end of the road in Vatia Village, where it is possible to look up at the base of Pola Island from fairly close. Although that site provides a closer view of the island, only a portion of the eastern slope is visible. After that we hiked the Tuafanua Trail, which goes over a saddle in the ridge to a beach that provides a good view of the entire western side of Pola Island. Many boobies, frigatebirds, and noddies are visible on the island. Although it requires a hike over the ridge and then a walk on the rocky beach, it is an excellent site from which to monitor seabirds. A telescope would be useful here too.

After lunch we all went to Masefau, on the northern coast of Tutuila and farther east. We stopped at an overlook where Masefau Island can be viewed, but there were only a few Brown Noddies and frigatebirds flying over the island. Apparently, Brown and Black Noddies are reported to occur here in larger numbers, and it is possible more would be present earlier or later in the day. From what we saw, it is not an important seabird site but additional visits would be warranted to further assess its status. Mark said that rats had been eradicated from the island several years ago, but that the island was re-invaded quickly because it is possible to walk to the island at low tide.

9 November. I went with Brian Peck of USFWS on his boat to view some seabird areas from the ocean. We went east along the shoreline from Breakers Point on the eastern side of Pago Pago Harbor to just west of Alega Village, and we did not see any seabirds on land or flying close to shore. Although there are some small cliffs and rocks along this section of shoreline that could be suitable for seabirds, there is substantial human development in this area that likely discourages them from using it, and there likely are many predators present too.

We then drove to the back side of Aunu'u Island to view the cliffs on the eastern side of the island that are not visible from the viewpoint on the island. The rocky cliffs south of the viewpoint are bare of vegetation and appear to be washed over by high waves periodically. The sloping shape of these cliffs may allow waves to wash up higher here than in other areas. There was one medium sized cave about 50 meters south of the viewpoint, in which one Brown Booby and two Blue-gray Noddies were present, and several areas of guano were visible on the rocks. On the cliffs that are visible from the viewpoint on the island there were two Bridled Terns and two Blue-gray Noddies. North of the viewpoint on the island there was a more extensive area about 200 meters long where seabirds were roosting on ledges and cliffs. About 50 Brown Noddies and 20 Brown Boobies flushed from the ledges as we drove past. There was a lot of guano on the cliffs indicating the birds spend a lot of time there, but no nest sites were visible. The choppy sea conditions made it difficult to see some spots clearly, and this site warrants further examination.

Brown Noddies on cliff on eastern side of Aunu'u Island.

A large seabird feeding flock was visible about a mile south of Aunu'u, and we drove out to look at it more closely. As we approached, we realized the flock extended far to the west and south and contained more than 1,000 birds. We passed through and around the flock several times as the bird activity shifted in response to fish movements. We estimated there were about 600 Brown Noddies, 300 Black Noddies, 80 Brown Boobies, 70 Red-footed Boobies, 20 White Terns, 10 Blue-gray Noddies, and 5 Bridled Terns. Also present were smaller numbers of species that are not known from Tutuila, including 45 Wedge-tailed Shearwaters, 2 Sooty Shearwaters, 12 Tropical Shearwaters, and 1 Sooty Tern. We found several more feeding flocks on the way back to the harbor, but they contained only species known to occur on Tutuila.

Seabird feeding flock south of Aunu'u Island.

10 November. I went with Mark MacDonald to his office to inventory and examine the song meters left over from Andrew Titmus' research on Ta'u (Titmus 2017). We opened all the song meters and associated equipment, and we removed all the old batteries. A couple of song meters and external power sources were obviously broken or severely corroded (bad), some appeared to be in working order (good), and some might be functional if they were cleaned up (questionable). The SM4 microphones were in a plastic bag and were still wet so we laid them out to dry. The table below summarizes the condition of the equipment.

Equipment	# Good	# Bad	# Questionable
SM4 song meter	2		1
SM2 song meter	5	2	1
SM4 microphone			13
External battery pack-large	3		
External battery pack-small	4	2	2

Action Items:

- Eric to provide email introduction for Mark McDonald to Scott Hall of the National Fish and Wildlife Foundation (NFWF) and Matthew McCown of Conservation Metrics. NFWF purchased a number of song meters to support research being done by Andrew Titmus, who was a graduate student at the University of Hawaii studying nocturnal seabirds on the island of Ta'u. The song meters from Andrew's project are in Mark's office, but their disposition had not been made clear. Eric emailed with Scott Hall of Matthew McCown about the song meters after he returned to Honolulu, and they confirmed that the song meters are available for continued use in American Samoa. Brian will be deploying one of the song meters on Rose Atoll later in November, and Mark will work of testing the microphones and song meters, and then determining where on Tutuila to deploy the remaining units.

- Eric to forward email to Tavita, Brian, and Mark about predator control questionnaire and workshop to be held in Honolulu. Tavita was already was aware of this effort, but the others were not. This effort is being coordinated by several agencies in Hawaii, including the USFWS and Hawaii Division of Land and Natural Resources, and is intended to increase sharing of information about predator control among various agencies in Hawaii, and also would be beneficial for American Samoa biologists.
- Eric to email a photograph of White-throated Storm-Petrel to Brian Peck to use as a model for decoy carving. Brian is working with a decoy artist to produce decoys for Rose Atoll during a decoy carving workshop, and Eric recommended that White-throated Storm-Petrel would be a good species to focus on because their conservation is high priority, and because their small size would make it easier to carve life size decoys.
- Eric to email Tavita Togia information about telescopes for monitoring seabirds and where to order one.
- Eric to provide contact for Alaska Bird Research (ABR) to Mark MacDonald in order to obtain more information about radar surveys and training.
- Roberta to follow up with Dr. Andre Raine of Kaua'i Endangered Seabird Recovery Project about assistance with design and implementation of radar surveys. Roberta has been in contact with Dr. Raine who is willing to assist in the planning and implementation of radar surveys for American Samoa. Accepting Dr. Raine's assistance would be an economical alternative to contracting a consultant.
- Eric to discuss Swain's Island rat eradication with Nick Holmes of Island Conservation, find out if IC is still interested in collaborating and if so what their time line is, so that DMWR can pursue other options, if necessary.

Literature Cited

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Figure 1. Map of Tutuila showing locations of sites mentioned in the text.